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MINERAL INFORMATION SERVICE is designed to inform the public on the geology and mineral resources of California and on the usefulness of minerals and rocks, and to serve as a news release on mineral discoveries, mining operations, markets, statistics, and new publications. It is issued monthly by the California State Division of Mines. Subscription price, January through December, is \$1.00.

ALUMINUM

Aluminum is one of the most abundant metals in the earth's crust and is found in nearly all rocks. Only under special geologic conditions, however, does alumina occur in large high-grade deposits that can be economically worked as a source of the metal. At present the only important ore of aluminum is bauxite. The principal domestic deposits of bauxite are in Arkansas, Georgia, Alabama, and Mississippi. These contain only 2½ percent of the world's reserves and many cannot compete either in quality or price with foreign imports. In 1955, the domestic deposits supplied about 26 percent (1,818,038 long tons) of the bauxite consumed in the United States. The balance (5,221,008 long tons) was drawn principally from South America, notably from the Guianas, and from the Caribbean Islands of Jamaica and Haiti. The United States ranks first in the production of primary aluminum metal, supplying nearly 48 percent of the world total of 3,050,000 tons in 1954.

The known occurrences of bauxite in California are limited to small deposits which are associated with fire clay. None of these deposits have proved large enough to have been developed as a commercial source of aluminum; nor has this metal been recovered from any raw material mined in California. Other alumina-rich deposits, principally the large anorthosite bodies that are in the southern part of the state and the widespread alumina-rich clays, constitute potential reserves that may eventually yield aluminum on a commercial basis.

Geology and mineralogy

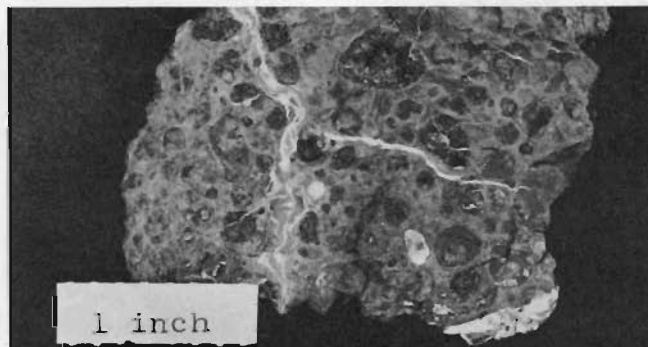
Bauxite is a colloidal mixture composed of various proportions of the minerals gibbsite ($\text{Al}(\text{OH})_3$) and the dimorphic forms boehmite and diaspore, both ($\text{AlO}(\text{OH})$) (Palache et al., 1944, p. 667). Common impurities are rutile, siliceous minerals such as kaolinite and quartz as well as the iron oxides—limonite, hematite and goethite, and the carbonate minerals calcite, magnesite and siderite. Bauxite is gray, cream, yellow, dark red to earthy brown, is normally pisolitic or oolitic, and generally has a mottled appearance.

Bauxite is a residual product formed by the deep weathering of aluminous rocks under tropical conditions, and is commonly a constituent of lateritic soils. Under these extreme conditions of weather-

ing, the silica and iron are partly removed, water is introduced and oxides of aluminum, titanium and iron are concentrated (Table 1, Analyses 7-10). Climate, parent rock, chemical composition of the groundwater, surface of formation, drainage and time are all contributory factors in bauxite formation. The principal parent rocks that have been altered to bauxite are nepheline syenite, granite, clay-bearing limestone, diorite, basalt, shale, clay and dolerite.

Bauxite develops in areas that have a savanna type tropical climate and much of the world's bauxite reserves are in the tropics in such countries as Jamaica, Gold Coast, and Brazil. "Fossil deposits" such as those in Hungary, France, China, Yugoslavia and the United States, occur in areas where a tropical climate prevailed during the geologic past, but which today have another type of climate. Bauxite deposits range in age from Devonian to Recent, but most are late Mesozoic to early Tertiary. The domestic deposits are Eocene in age.

Bauxite deposits have been divided into three types: blanket, interstratified and pocket. Blanket deposits are generally horizontal, near the surface and underlie a thin soil cover in areas in the late stages of erosion. The deposits in the southeastern United States and Gold Coast are examples of this



Alumina-rich laterite from Ione, Amador County, California. Illustrating pisolites and general mottled appearance. This material ranges from about 30 to 40 percent alumina.